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Research Article

Digital technology practices for vocational teachers in the industrial revolution 4.0: Mediating technology self-efficacy

Choyrul Anwar[1], Herminarto Sofyan[2], Nani Ratnaningsih[3] and Muh. Asriadi AM[4]

[1]*Universitas Negeri Yogyakarta, Indonesia (ORCID: 0000-0001-8489-0589)*
[2]*Universitas Negeri Yogyakarta, Indonesia (ORCID: 0000-0003-0006-2423)*
[3]*Universitas Negeri Yogyakarta, Indonesia (ORCID: 0000-0002-8393-9341)*
[4]*Universitas Pendidikan Indonesia, Indonesia (ORCID: 0000-0003-4370-3550)*

The efficacy of vocational teachers' utilisation of digital technology in the context of the Industrial Revolution 4.0 remains a pressing concern that necessitates pragmatic resolutions. Social support and infrastructure are the leading causes of the limited technological self-efficacy of digital technology practices. This research seeks to examine the impact of infrastructure and social support through technological self-efficacy on vocational teachers' digital technology practices during the Industrial Revolution 4.0. The research employed a quantitative approach and ex-post-facto methods, involving 207 vocational teacher respondents. The data was analysed using structural equation modelling techniques, namely path analysis and bootstrapping approaches. The inquiry results indicate that technological self-efficacy acts as a mediator of digital technology practices, with a statistically significant *p*-value of less than .05. The relationship between social support for digital technology practices and technology self-efficacy is mediated by an estimate of 0.089 with a *p*-value of .019. Similarly, the relationship between infrastructure for digital technology practices and technology self-efficacy is mediated by an estimate of 0.250 with a *p*-value of .000. A comprehensive analysis of variables, including their direct, indirect, and total effects, revealed a considerable influence of the variables included in the study. After analysing the features of each respondent, a *p*-value < .05 was achieved, indicating a significant influence between the variables evaluated. It suggests that the relationship between the variables can be broadly applied to the characteristics of each respondent. Enhancing digital technology practices in vocational education requires increased efforts from educational institutions and the government.

Keywords Industrial revolution 4.0; Vocational education; Digital technology practices

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1. Introduction

The issue of digital transformation in education has become a prominent problem in recent times, necessitating a thorough investigation (Spöttl et al., 2021; Ustundag & Cevikcan, 2018). Academic institutions must implement specific strategies to maximise the effectiveness of digital technology (Roll & Ifenthaler, 2021; Spante et al., 2018). To effectively address the technological challenges

Address of Corresponding Author

Choyrul Anwar, Universitas Negeri Yogyakarta, Jl. Colombo No.1 Karangmalang Yogyakarta 55281, Indonesia.

choyrulbf19@gmail.com

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posed by Industrial Revolution 4.0, vocational education needs to provide students with the necessary skills and knowledge (Roll & Ifenthaler, 2021; Spurk, 2021; Xu et al., 2018). The link-and-match design with industry still needs to be finalised so that vocational education can create a workforce that meets industry needs (McGrath et al., 2020; Sudira, 2019). According to research by (Pusriawan & Soenarto, 2019; Sudana et al., 2019), there is an inverse relationship between the number of graduates and the rate of integration of vocational education graduates in developing countries. In August 2021, the vocational school open unemployment rate in Indonesia was the highest among all educational levels, standing at 11.13% (Central Statistics Agency, 2022). Several factors contribute to the need for more assimilation of vocational school graduates into the labour market. These factors encompass inefficient implementation of procedures, insufficient data input, and a human resources department that does not adjust to progress in the industry (Ana et al., 2020; Sudana et al., 2019). It is crucial to enhance the performance of vocational instructors in effectively transmitting knowledge to students (Nurtanto et al., 2022).

To ensure the effectiveness of the learning process, vocational educators must utilise digital technologies. Amidst the Industrial Revolution 4.0, students must acquire practical knowledge of effectively applying technology to meet the demands of their specific disciplines (Spöttl et al., 2021). Developing nations are integrating digital technology into their educational systems to improve academic performance (Barbosa Neves et al., 2019; Kholifah et al., 2022). The utilisation of digital technology by educators to teach subject-specific knowledge to pupils has a notable influence (O'Donovan & Smith, 2020; Prodani et al., 2020). Instructional methods need to adapt to include digital learning technology (König et al., 2020). The Industrial Revolution 4.0 changed how teachers saw digital technology (Anwar & Sudira, 2022). The significance of digital technology for academic accomplishment is paramount (Anwar & Sudira, 2022; Puriwat & Tripopsakul, 2020). The inevitability of this reality stems from the profound influence that digital technology has exerted across nearly all fields of study. Researchers have suggested that educators should examine the 4C abilities (creative thinking, critical thinking, cooperation, and communication) that are crucial for developing essential skills in individuals in the modern digital era (Kholifah et al., 2023; Sopa et al., 2020). Educators who adapt to improvements in digital technology will avoid falling behind their colleagues and facing difficulties in fulfilling their responsibilities (Gunadi et al., 2020).

The integration of digital technology in education faces significant challenges, including the inadequate training of vocational instructors, the need for curriculum updates, and the establishment of policies that support the development of effective digital teaching methods (Akyazi et al., 2022; Yudiono et al., 2018). In the realm of teacher competence, a study conducted by (Astuti et al., 2022) unveiled the following percentages: The percentages are as follows: 59.20% for digital technology awareness, 56.585% for digital technology literacy, 49.94% for digital technology aptitude, 42.72% for digital technology creativity, and 41.22% for digital technology critique. The average of these results classifies them as being in the low range. Further investigation into successful digital technology practices in vocational education is necessary, considering this phenomenon. Several studies (Pardjono et al., 2018; Spöttl et al., 2021) have shown that incorporating digital technology into education helps students improve their vocational technology skills, stimulate their creativity and critical thinking abilities, and better prepare them for employment in the digital era. Consult Figure 1 to see a visual representation of the expected impact of internal and external elements on digital technology practices. However, this study only investigates characteristics that are regarded as having a substantial impact on digital technology practices, such as social support, self-efficacy, and infrastructure.

The extent to which technology self-efficacy supports digital technology practices has yet to be thoroughly investigated (Kholifah et al., 2023). The implementation of digital technology practices will, in principle, be predicated on the technology self-efficacy of vocational educators (Kholifah et al., 2023; Van Hong et al., 2018). According to (Huffman et al., 2013; Khlaif et al., 2023), determining the effectiveness of the digital technology practice idea throughout the Industrial

Revolution 4.0 heavily depends on technological self-efficacy. According to (Jaedun et al., 2022), having a high level of technology self-efficacy will boost the confidence needed to apply technology-based learning effectively. The second study conducted by (Handrianto et al., 2023) revealed that self-efficacy has a positive impact on task performance. The impact of optimistic beliefs on work results might be attributed to their ability to enhance self-assurance (Hirschi & Koen, 2021). Some people find the concept of technology self-efficacy to be complex (Huffman et al., 2013). Conversely, trust in technology can be strengthened when environmental conditions are favourable.

Infrastructure is a determinant that can influence the implementation of digital technology activities (Larsson & Löwstedt, 2023). Having sufficient infrastructure will enable teachers to utilise digital technology effectively (Barrett et al., 2019; Larsson & Löwstedt, 2023). It implies that infrastructure conditions necessitate that educators master and implement digital technology in accordance with their field. In contrast, studies suggest that the increasing reliance on digital technology in modern times necessitates a more significant investment in infrastructure (Prodani et al., 2020). Vocational instructors are permitted to implement digital technology innovatively so long as the necessary conditions are fulfilled (Nurtanto et al., 2022). Further investigation is necessary about the impact of infrastructure on digital technology practices in vocational education.

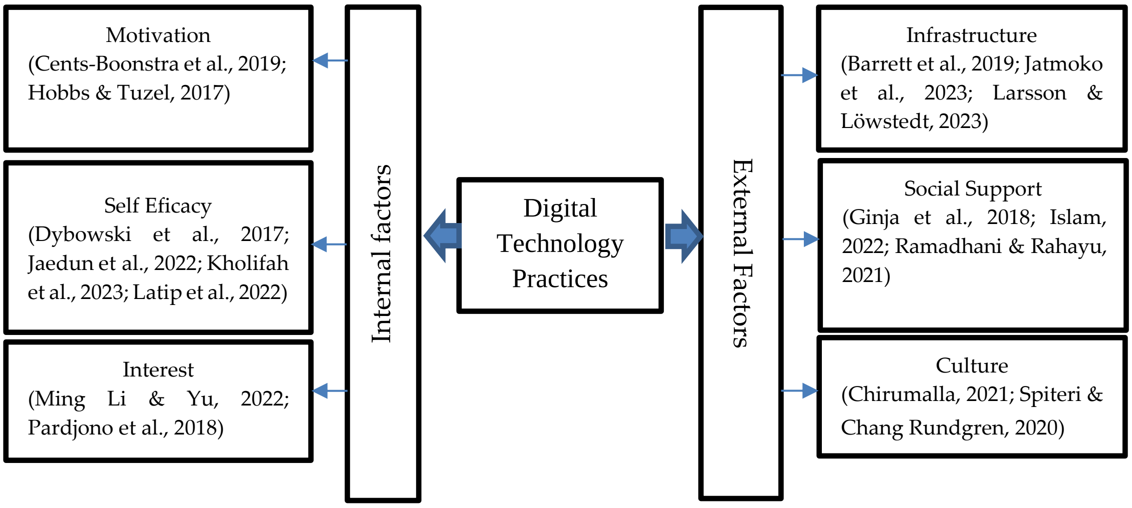
In addition to infrastructure, social support emerges as a critical determinant capable of exerting an impact on digital technology practices (Ginja et al., 2018; Islam, 2022; Ramadhani & Rahayu, 2021). Social support affects the level of confidence that educators have in their use of digital technology practices (Munan Li et al., 2018). Social support is an essential component that warrants investigation within the realm of research in order to provide a comprehensive explanation of its effects on technology applications (Barbosa Neves et al., 2019). Adequate social support is essential for educators to meet their obligations in the digital era. In order to cultivate knowledge in accordance with the circumstances of the discipline, educators require support in the form of recommendations, counsel, consideration, and additional aid (Ginja et al., 2018; Islam, 2022).

Essential points are interesting to study in more depth regarding gaps in the field. A study of vocational school teachers' digital technology practices is needed as a parameter for assessment and competency development by relevant agencies. In the context of this research, technology self-efficacy needs to be revealed about its role in mediating factors that influence digital technology practices. This research aims to evaluate the influence of infrastructure and social support on digital technology practice through technological mediation of vocational teachers' self-efficacy in facing work challenges in the Industrial Revolution 4.0. The research results can contribute as a basis for developing digital technology practices by vocational teachers to maximize their performance. In the industrial revolution 4.0, digital technology practices must be applied in all fields to solve problems and have a significant impact in facing challenges that arise in the field.

1.1. Background

Digital technology practice involves the application of digital technology by humans to improve the efficiency and effectiveness of different processes (Chirumalla, 2021; Puriwat & Tripopsakul, 2020). The subject of this study is a vocational teacher who utilises their skills to carry out their responsibilities. In the context of the Industrial Revolution 4.0, digital technology played a pivotal role in enabling vocational teachers to provide education tailored to students' specialised areas of study (Bujang et al., 2020). Multiple factors shape digital technology. The elements can be classified into internal components, including motivation, self-efficacy, and interest, and external aspects, such as infrastructure, social and cultural support (see Figure 1). Theoretical studies indicate that infrastructure, social support, and self-efficiency are the most important aspects of digital technology practices. These factors were therefore designated as research variables. Figure 1 depicts the several factors that influence the implementation of digital technology.

Figure 1
Concept of factors influencing digital technology practices



1.1.1. Infrastructure and social support in technology self-efficacy

Psychological processes serve as indicators of an individual's capacity to perform activities, accomplish objectives, or overcome challenges, hence serving as a basis for self-efficacy (Bandura, 1982). Self-efficacy has a direct influence on an individual's confidence and self-assurance in carrying out their work duties (Bandura, 1982). Within the scope of the research, infrastructure and social support are factors that affect technology self-efficacy. In the modern era, it is still necessary to seek recommendations, opinions, and concerns from others in order to gather feedback and ensure the successful implementation of a programme (Ginja et al., 2018). Vocational teachers' technology self-efficacy requires the provision of support and emotional warmth, as well as material aid, from others. Input and concern from school inhabitants or other individuals are necessary to provide social support in expanding the field of education (Roll & Ifenthaler, 2021). Optimal learning outcomes can be achieved through the provision of conducive environmental circumstances that facilitate effective and efficient learning.

Technology-focused vocational teachers rely on the state of infrastructure (Ally, 2019; Mangiri et al., 2019). In the context of the Industrial Revolution 4.0, it is commonplace for teachers to utilise and employ advanced technology in order to facilitate students' comprehension and engagement (König et al., 2020). Educational institutions require effective infrastructure management and governance to facilitate optimal learning (Barrett et al., 2019). Administrative support plays a crucial role in the administration and governance of infrastructure (Larsson & Löwstedt, 2023). Teachers require a manual to effectively utilise infrastructure in its implementation. This guide guarantees that infrastructure can be utilised in accordance with specified standard operational procedures. Without this assistance, there is concern that it may promote mistakes in its utilisation, leading to user detriment. Moreover, the implementation of policy assistance plays a crucial role in assisting the administration in carrying out infrastructure projects (Barrett et al., 2019). Users in this context, namely vocational school teachers, are required to comply with the policies established by the government and school agencies. By implementing regulations that facilitate the integration of technology in vocational education, instructors' engagement and commitment towards this field would be enhanced.

1.1.2. Infrastructure, social support and technology self-efficacy in digital technology practices

In recent times, digital technology has had a substantial influence on several occupations (Astuti et al., 2022). Nevertheless, in actual implementation, there remain several impediments that require adequate resolution. Technology self-efficacy is crucial in promoting the adoption of digital technology activities (Kholifah et al., 2023). Prior research has identified indices of self-efficacy, such as level, strength, and generality (Handrianto et al., 2023; Honicke & Broadbent, 2016; Kholifah et al., 2023). Within the scope of this study, the amount of confidence pertains to one's ability to accomplish tasks using technology, as well as the degree of self-motivation to engage with technology. Meanwhile, strength manifests through the presence of self-assurance in exerting effort, unwavering determination, and meticulousness in utilising technology. According to research (Asfahani, 2023), belief in one's ability to overcome technological problems is also a valuable asset when confronting such challenges. Generality refers to the state of having confidence in one's ability to solve challenges in different contexts, as well as confidence in the ability to innovate using technology.

It is essential to take into account social support and infrastructure in order to effectively support the implementation of digital technology practices (Barrett et al., 2019). The provision of social support by colleagues or individuals who are invested in education is a vital component that must be noticed (Islam, 2022). Practical social support provides instructors with a sense of stability in performing their duties. This particular framework signifies the necessity for individual consciousness regarding societal assistance when confronting the difficulties brought about by the Industrial Revolution 4.0 (Barbosa Neves et al., 2019). Similarly, the presence of infrastructure support that is in line with technological advancements can motivate educators to utilise technology-based learning materials (Larsson & Löwstedt, 2023). An efficiently structured support system in digital technology practices will facilitate success in its implementation in order to achieve advantageous outcomes that have an impact on the accomplishment of the intended objectives.

1.1.3. Mediation of technology self-efficacy in digital technology practices

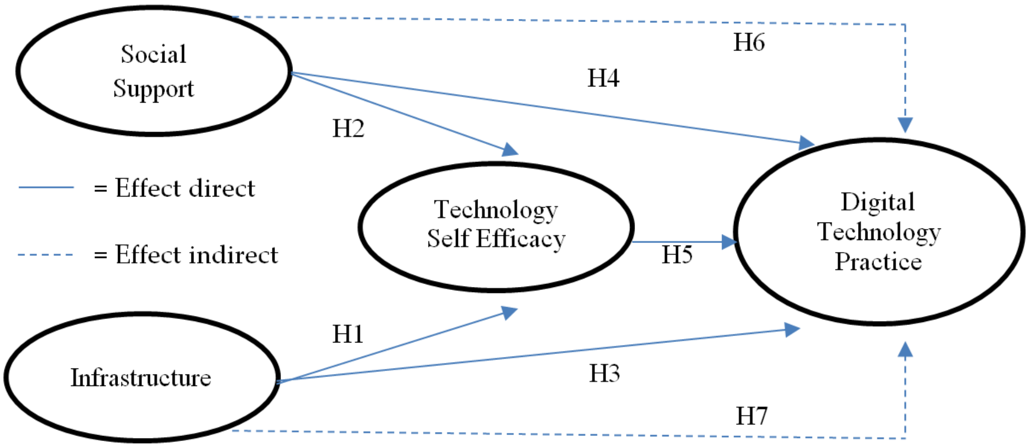
Comprehending digital literacy is a fundamental basis for engaging in the use of digital technology (Ming Li & Yu, 2022). Prior studies have highlighted the importance of comprehending the context and direction of digital technology applications in digital technology practice (Ginja et al., 2018; Van Hong et al., 2018). In order to accomplish desired outcomes, it is crucial to prioritise accessibility and engaging exploration in digital technology practices (Kholifah et al., 2022). Assessing information is extremely important when implementing digital technology practices, particularly when it comes to selecting information based on specific objectives (Hajli, 2018). Another crucial aspect is the innovative utilisation of digital technology in accordance with the specific context of its purpose and application (Kim et al., 2019). The practical components of digital technology collectively constitute a cohesive entity that can impact the objectives of vocational education. According to (Blackwell et al., 2014), utilising digital technology requires a significant level of self-assurance.

In order to achieve optimal outcomes in their digital technology practices, vocational teachers require a high level of technology self-efficacy (Kholifah et al., 2023; Koca et al., 2023). Teachers' confidence in their ability to adapt to technological advancements requires a high level of Proficiency in digital literacy (Spante et al., 2018). Proficiency in technology and self-efficacy are crucial for vocational teachers. Further investigation is required to fully understand the function of technological self-efficacy in the digital technology practice of vocational teachers. Vocational teachers play a crucial role in imparting scientific information and training individuals to confront the problems posed by the Industrial Revolution 4.0 (Ana et al., 2020; Van Hong et al., 2018).

1.2. Present Study

The investigation will investigate seven possibilities based on the theoretical study mentioned earlier. In order to attain research aims, it is imperative to address the hypotheses in a research study. Figure 2 provides a concise representation of a primary research notion, serving as an initial picture prior to subsequent steps and indicating the placement of the hypothesis within the investigation.

Figure 2
Research concept



The following hypotheses were proposed:

H1. There is a significant positive influence of infrastructure on technology self-efficacy.

H2. There is a significant positive influence of Social Support on technology self-efficacy.

H3. There is a significant positive influence of infrastructure on digital technology practices.

H4. There is a significant positive influence of Social Support on digital technology practices.

H5. There is a significant positive influence of technology self-efficacy on digital technology practices.

H6. Social Support has a significant positive influence on digital technology practices, which is mediated by technology self-efficacy.

H7. Infrastructure has a significant positive influence on digital technology practices, which is mediated by technology self-efficacy.

2. Method

2.1. Research Design

The study aimed to assess the impact of technological self-efficacy on vocational teachers' digital technology practice by examining its function in moderating the influence of social support and infrastructure. In addition, the study assessed the impact of infrastructure and social support on individuals' confidence in using technology, as well as the impact of infrastructure, social support, and technology self-efficacy on individuals' actual use of digital technology. The research design is depicted in Figure 1, which illustrates the study design. In addition, the study also assessed every attribute of the participants involved in the research. Vocational teachers' replies are examined through a quantitative method in the research design, data collection, data processing, and data analysis stages. To examine events that have already happened, the research design uses ex post facto methodology. Ex-post facto, or retrospective, research designs are used when researchers cannot manipulate the independent variable (in this case, technology self-efficacy) for ethical or practical reasons (Creswell, 2014). The reason for choosing an ex-post facto design is to observe and analyze the conditions or variables that exist among vocational school teachers and then retrospectively examine their impact on digital technology practices. So it will be very useful for studying natural events or conditions that cannot be manipulated. In addition, an ex-post facto research design was chosen in this study because it is in line with the research objective of assessing the impact of technology self-efficacy on vocational school teachers' digital technology practices in the real world. The direct influence and role of mediation are assessed by utilising empirical data collected in the field in accordance with the conceptual framework and theoretical studies conducted. The analysed data provides insights into the contribution of each aspect to enhancing digital technology practices.

2.2. Participants

The research focused on vocational teachers in Karanganyar Regency, Central Java, Indonesia, selecting 207 respondents through purposive sampling. This deliberate sampling method allowed the researchers to choose participants based on specific criteria relevant to the study's objectives. The sample encompassed diverse characteristics, including gender, teaching institution origin (public and private), areas of expertise (such as technology and engineering, tourism, management and business, information and communication engineering), and teaching experience categories (under 10 years, 11 to 20 years, and over 21 years). The goal was to ensure a comprehensive representation for assessing the impact of technological self-efficacy on digital technology practice in various contexts. Table 1 provided a detailed analysis of participant attributes, offering transparency regarding the distribution of respondents across different categories. In terms of data collection, a quantitative approach was employed, likely involving structured surveys or questionnaires to gather numerical data on key variables, including technological self-efficacy, social support, infrastructure, confidence in using technology, and actual use of digital technology. The geographic scope of the study was confined to Karanganyar Regency, providing a specific context for the investigation.

Table 1
Characteristics of research respondents

Parameter	*Respondent*	*Percentage*
Year of experience		
Under 10 years old	72	34.78
11 to 20 years	89	43.00
Over 21 years old	46	22.22
School Type		
Public school	83	40.10
Private school	124	59.90
Expertise		
Technology and Engineering	92	49.28
Informatics and Communication Engineering	50	19.32
Business and management	34	16.43
Tourist	31	14.97
Gender		
Male	141	68.12
Female	66	31.88

2.3. Instruments

Research variable statements are included in the questionnaires used in the data collection procedure. The purpose of using questionnaires is to gauge respondents' answers on the study's variables. The instruments are created to be in line with study variables and field conditions after a thorough analysis of relevant literature. Four Likert scales are employed in this instrument, with the choices being very agree (SA), agree (A), disagree (D), and extremely disagreed (SD). The validity and reliability of the question item used in this study was confirmed before it was used. Up to 22 instrument items are employed in the questionnaire to measure the four variables that have been brought up. Table 2 lists the study's variables along with the indicators that go along with them.

2.4. Data Analysis

During the data analysis phase, this research utilised SEM-PLS software version 3. Structural equation models (SEM) are employed to quantify the impact of exogenous variables on endogenous variables (Leguina, 2015). The SEM model encompasses both theories and prior

Table 2
Research variables and indicators

Indicator	*Sub Indicator*	*Code*
Infrastructure		
Infrastructure Management and Governance	Equipment availability	IN1
	Environmental conditions	IN2
	Equipment management	IN3
Administrative support	Infrastructure usage guide	IN4
	Rules applied	IN5
Social Support		
Suggestions and advice	Support suggestions from others	SS1
	Support advice from others	SS2
Attention	Attention or emotional support in the form of warmth	SS3
Concern	Concern from others	SS4
Material assistance	Material assistance from others	SS5
Technology Self-Efficacy		
Level	Confidence complete tasks with technology	TSE1
	Confidence to motivate yourself to use technology	TSE2
Strenght	Confidence in being able to try hard, be persistent and diligent with technology	TSE3
	Confidence in being able to survive technological challenges	TSE4
Generality	Confidence in solving problems in various situations	TSE5
	Confidence in innovating with technology	TSE6
Digital Technology Practice		
Context and orientation	Understand the context of digital technology	DTP1
	Understand digital technology orientation	DTP2
Accessibility and exploration	Accessibility effectively and efficiently	DTP3
	Explore effectively and efficiently	DTP4
Evaluate information	Selective information according to objectives	DTP5
Digital creativity	Creative in utilizing digital technology	DTP6

research that have been identified as utilising mediators as well as those that do not involve mediators. Confirmatory factor analysis (CFA) was employed to assess the validity and reliability of the study tools. Path analysis is employed to quantify the direct impact of infrastructure and social support on technology self-efficacy, as well as the impact of social support, infrastructure, and technology self-efficacy on the digital technology practice of vocational teachers. Meanwhile, the bootstrap technique quantifies the impact of technological self-efficacy as a mediator of social support and infrastructure on digital technology behaviours.

3. Findings

3.1. Results of Testing the Validity and Reliability of the Instrument

It is possible to tell how well the instrument works by looking at the average variance extracted (AVE) and the outer loading of all the indicators. An outer loading above 0.70 implies that the indicators can be attributed to the construct being measured. Similarly, a high AVE value suggests that, on average, a construct effectively captures the variation of its indicators (Leguina, 2015). The VIF score should be below 5, as a value above 5 suggests the presence of collinearity between constructs (Sarstedt et al., 2017). Table 3 provides an analysis of the instrument's convergent validity findings.

Table 3
Convergence validity of research instruments

Indicator	*VIF*	*Outer Loading*	*Outer Weight*	*Decision*
Infrastructure (IN)				
IN1	4.130	0.742	0.265	Valid
IN2	3.184	0.704	0.228	Valid
IN3	4.569	0.801	0.313	Valid
IN4	2.977	0.807	0.221	Valid
IN5	2.844	0.812	0.261	Valid
Social Support (SS)				
SS1	4.467	0.810	0.260	Valid
SS2	1.834	0.833	0.170	Valid
SS3	1.732	0.893	0.236	Valid
SS4	1.705	0.905	0.241	Valid
SS5	4.309	0.855	0.257	Valid
Technology Self Efficacy (TSE)				
TSE1	4.296	0.758	0.226	Valid
TSE2	2.403	0.772	0.212	Valid
TSE3	2.768	0.723	0.223	Valid
TSE4	3.536	0.775	0.209	Valid
TSE5	4.183	0.754	0.228	Valid
TSE6	2.838	0.716	0.238	Valid
Digital Technology Practice (DTP)				
DTP1	1.749	0.899	0.192	Valid
DTP2	2.000	0.879	0.191	Valid
DTP3	1.574	0.895	0.196	Valid
DTP4	1.963	0.861	0.182	Valid
DTP5	1.836	0.836	0.188	Valid
DTP6	1.633	0.910	0.188	Valid

The outcomes of the PLS method, as presented in Table 3, indicate that the outer loading values for all indicators fall within the range of 0.704 to 0.910. It is worth noting that these values are beyond the acceptable threshold of 0.70. Next is discriminant validity, which demonstrates the distinctiveness of the generated variables in comparison to other constructs. Three methods for evaluating the accuracy of descriptors are cross-loading, Fornell-Larcker, and heterotrait-monotrait (HTMT) criteria. The research used the Fornell-Larcker value, which requires that the square root of each Average Variance Extracted (AVE) construct exceed the correlation value with other constructs. The test results indicated that the AVE construct value exhibited greater significance compared to the correlation value with other constructs. It signifies that the research findings satisfy the standards for discriminant validity and are suitable for subsequent testing. Table 4 shows the analysis of the Fornell-Larcker values.

Table 4
Fornell-Larcker results

Constructs	*DTP*	*IN*	*SS*	*TSE*
DTP	0.880			
IN	0.779	0.775		
SS	0.343	0.195	0.860	
TSE	0.782	0.568	0.293	0.750

The subsequent phase necessitates the assessment of internal consistency and reliability. The user is referring to the utilization of Cronbach's alpha (CA), rho A, and composite reliability (CR) indicators to assess the consistency and reliability of a test. Each measurement is deemed reliable and must be above a threshold of 0.70. Table 4 displays the range of values for CA, which varies from 0.833 to 0.942; rho A, which ranges from 0.841 to 0.942; and CR, which varies from 0.882 to 0.954. The results of this test indicate that all measurements of the construct have a value greater than 0.70. Moreover, the AVE value varies between 0.563 and 0.775, surpassing the minimum threshold of 0.50. All measuring constructs used in vocational teacher, digital technology practice are reliable. Table 5 provides the analysis of reliability of the instrument.

Table 5
The reliability of the instrument

Variable	*CA (≥ 0.70)*	*rho A (≥ 0.70)*	*CR (≥ 0.70)*	*AVE (≥ 0.50)*	*Desicion*
DTP	0.942	0.942	0.954	0.775	Reliable
IN	0.833	0.841	0.882	0.600	Reliable
SS	0.912	0.920	0.934	0.739	Reliable
TSE	0.844	0.844	0.885	0.563	Reliable

3.2. Goodness of Fit

The goodness-of-fit indicators in this study used three test models: Chi-Square, Standardised Root Mean Square (SRMR), and Normal Fit Index (NFI). The SRMR model is acceptable if it has a value of less than 0.08 (Hu & Bentler, 1999). Meanwhile, Chi-Square is acceptable if it has a value of more than 0.90 (Hu & Bentler, 1999). The NFI value criteria range from 0 to 1, with a value close to 1 indicating a high model goodness of fit. In Table 6, the results obtained are saturated SRMR, and the model estimate is 0.077 (less than 0.08). Chi-Square obtained a saturated and estimated model value of 968,219 (more than 0.90). Meanwhile, the NFI obtained a saturated and estimated model value of 0.745. Table 6 explains the goodness of fit results.

The second step of the structural model is evaluating the value of the determinant coefficient (R2). The R2 value ranges from 0.67, 0.33, and 0.19 or can be assessed as predictive power at substantial, moderate, and weak levels (Chin & Newsted, 1998). The table demonstrates that digital technology practices account for 78.8% of the explanation for technology self-efficacy,

Table 6
The goodness of fit results

The goodness of fit indices	*Saturated Model*	*Estimated Model*
SRMR	0.077	0.077
d_ULS	1.483	1.483
d_G	0.907	0.907
Chi-Square	968.219	968.219
NFI	0.745	0.745

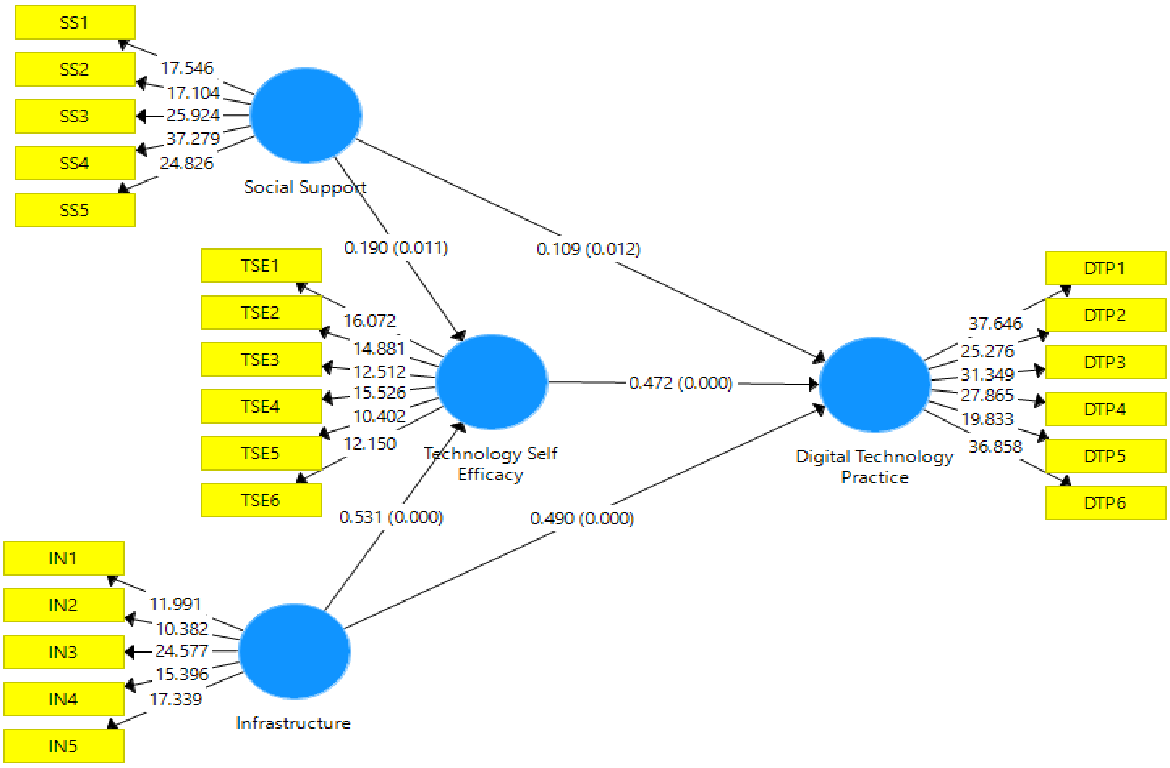
which is 35.7%. Next, it performs a relevance prediction test (Q2) using the blindfold procedure in PLS- SEM. The Q2 effect size, according to (Leguina, 2015), is grouped into three categories, namely weak (0.02), medium (0.15), and large (0.35). On the value of predictive relevance (Q2) for cross-validity redundancy against all endogenous variables, technology self-efficacy is 18.8%, and digital technology practice is 60.5%, which is greater than zero (Q2 > 0) (see Table 7).

Table 7
R2 and Q2 test results

Construct	*R^2*	*R^2 Adjusted*	*Predictive Power*	*Q^2 Redundancy*	*Effect Size*
Technology Self Efficacy	0.357	0.351	Moderate	0.188	Medium
Digital Technology Practice	0.788	0.785	Substantial	0.605	Large

Testing can proceed to the next stage after the validation and reliability criteria are met. Figure 3 shows the results of testing the influence values between the variables identified in the hypothesis. Results refer to the β-coefficient (estimation) and *p*-value (significance) between variables.

Figure 3
SEM PLS test results



3.3. Direct Effect Test

The standardization of path coefficient values and *p*-values is determined using hypothesis testing 1–5, depending on the results of path analysis. A significance level of 5% is used. Furthermore, the study also provides a 95% confidence interval (CI 95%) and a 5% error rate. Hypothesis testing was conducted to assess the direct impact of social support and infrastructure on technology self-efficacy as well as the impact of social support, infrastructure, and technology self-efficacy on digital technology practice. Testing was conducted utilizing both the entire sample and samples that were categorized according to the attributes of vocational teachers. Testing is conducted on respondent attributes to ascertain whether the hypothesis can be tested across all the qualities possessed by the respondent. The table provided below illustrates the process of hypothesis testing through the use of path analysis.

Table 8

Results of hypothesis testing using path analysis

Path Coefficients	*β*	*M*	*SD*	*t*	*p*	*Decision*
IN → DTP	0.490	0.486	0.088	5.568	.000	H1 (Accepted)
IN → TSE	0.531	0.531	0.082	6.508	.000	H2 (Accepted)
SS → DTP	0.109	0.109	0.043	2.534	.012	H3 (Accepted)
SS → TSE	0.190	0.194	0.074	2.554	.011	H4 (Accepted)
TSE → DTP	0.472	0.477	0.079	5.997	.000	H5 (Accepted)

As can be seen in Table 8, an estimated value of 0.490 and a significance level of .000 indicate that infrastructure has a significant impact on the use of digital technology. It supports the acceptance of hypothesis H1. Similarly, infrastructure has a substantial impact on technology self-efficacy, with a coefficient of 0.531 and a *p*-value of .000 (H2 accepted). A statistically significant estimate of 0.109 and a significance level of .012 (H3 accepted) indicate that the presence of social support has a significant impact on digital technology habits. The presence of social support has a significant impact on an individual's belief in their ability to use technology, as indicated by a coefficient of 0.190 and a significance level of .011. It supports the acceptance of Hypothesis 4 (H4). A coefficient of 0.472 with a significance level of .000 (H5 accepted) demonstrates the significant impact of technological self-efficacy on digital technology practice. The findings of the path analysis for each dimension by participant background are displayed in Table 9.

Table 9

Path analysis results for each dimension based on the participant's background

	p-value				
Participants	IN → DTP	IN → TSE	SS → DTP	SS → SE	TSE → DTP
Year of Experience					
< 10	.000	.013	.021	.030	.013
11 - 20	.000	.000	.001	.000	.000
> 21	.034	.000	.036	.019	.001
School Type					
Public	.000	.002	.001	.015	.002
Private	.000	.000	.011	.043	.000
Expertise					
TE	.000	.000	.020	.024	.001
ICE	.000	.000	.029	.035	.001
BM	.037	.012	.044	.041	.000
T	.019	.000	.036	.006	.000
Gender					
Male	.000	.000	.039	.019	.000
Female	.007	.000	.010	.028	.000

Note. TE: Technology and Engineering; ICE: Informatics and Communication Engineering; BM: Business and management; T: Tourist.

Table 9 indicates that the *p*-value, which is derived from the characteristics of the respondents, is less than .050 at a significance level of 5% (*p*-value < .050). The results demonstrate that the relationship between the factors examined (see Table 8) can be universally applied to the individual characteristics of each respondent. Significant results were obtained from a review that considered factors such as year of experience, kind of school, area of speciality of vocational teachers, and gender.

3.4. Mediation Effect of Technology Self-Efficacy

This step is employed to assess the importance of intervening variables in mediating the impact of exogenous variables on endogenous variables. Bootstrap analysis was used to examine the mediating effect of technology self-efficacy on digital technology practice. According to (Preacher & Hayes, 2008), bootstrapping is the most effective and logical approach to determining confidence bounds for indirect effects in various unique circumstances. Presented below is Table 10, displaying the outcomes of the mediation impact of technology self-efficacy.

Table 10
Results of the mediation effect of technology self-efficacy

Mediation pathway	*Effect direct*		*Effect indirect*		*Effect total*		*Hypothesis*
	β	*p*	*β*	*p*	*β*	*p*	
IN → DTP	0.490	.000	0.250	.000	0.740	.000	H6
IN → TSE	0.531	.000			0.531	.000	(Accepted)
SS → DTP	0.109	.012	0.089	.019	0.198	.000	H7
SS → TSE	0.190	.011			0.190	.011	(Accepted)
TSE → DTP	0.472	.000			0.472	.000	

Table 10 illustrates how technological self-efficacy acts as a mediator between infrastructure and social support, influencing vocational teachers' practices with digital technology. The bootstrap method yields a confidence interval with a 95% level of confidence. The study found that infrastructure indirectly affects digital technology practices through the mediation of technology self-efficacy, with an estimated effect size of 0.250 and a highly significant *p*-value of 0.000. Infrastructure plays a crucial role in indirectly shaping digital technology practices by facilitating technological self-efficacy (H6 is accepted). With a coefficient of 0.089 and a significance level of 0.019, technological self-efficacy influences the relationship between social support and digital technology practices. Social support has a notable and indirect impact on digital technology practices by acting as a mediator for technology self-efficacy (H7 is acknowledged). Table 11 displays the outcomes of the role of technology self-efficacy in mediating, taking into account the characteristics of the respondents. According to the analysis of Table 11, the influence of respondent characteristics on mediation's impact on technology self-efficacy is statistically significant at a level below .05. The analysis of teaching experience, school type, area of competence, and gender revealed statistically significant results (*p*-value < .05). It demonstrates that belief in one's ability to use technology effectively can act as a mediator between the availability of technological resources and the support received from others in the context of digital technology practices. Technology self-efficacy plays a crucial role in shaping one's engagement with digital technology practice activities.

4. Discussion

Research requires the validation of measurement devices to ensure their suitability for accurately measuring the targeted elements. The outer loading values, which range from 0.704 to 0.910 and are higher than the threshold of 0.70, demonstrate convergent validity. Additionally, the average variance extracted (AVE) ranges from 0.563 to 0.775, above the minimum requirement of 0.50. Moreover, discriminant validity is demonstrated by the fact that the square root of each Average Variance Extracted (AVE) construct exceeds the correlation value with other constructs. The instrument's reliability was assessed using Cronbach's alpha, which yielded values ranging from

Table 11
Results of the role of technology self-efficacy in mediating

Participant	*p-value*					
	Direct Effect		Indirect Effect		Total Effect	
	IN → DTP	SS → DTP	IN → DTP	SS → DTP	IN → DTP	SS → DTP
Year of Experience						
< 10	.000	.021	.010	.013	.000	.015
11 - 20	.000	.001	.000	.003	.000	.000
> 21	.034	.036	.011	.024	.000	.009
School Type						
Public	.000	.001	.030	.026	.000	.000
Private	.000	.011	.002	.000	.000	.000
Expertise						
TE	.000	.020	.011	.000	.000	.000
ICE	.000	.029	.000	.035	.000	.000
BM	.037	.044	.010	.013	.011	.001
T	.019	.036	.000	.017	.000	.000
Gender						
Male	.000	.039	.002	.019	.000	.002
Female	.007	.010	.000	.005	.000	.000

Note. TE: Technology and Engineering; ICE: Informatics and Communication Engineering; BM: Business and management; T: Tourist.

0.833 to 0.942, meeting the criterion of ≥ 0.70. The instrument's validity and reliability findings are consistent with the research conducted by (Asfahani, 2023; Jatmoko et al., 2023; Kholifah et al., 2023), as they satisfy the minimum value requirements for the research instrument. The obtained results indicate that tools assessing social support, infrastructure, technology self-efficacy, and digital technology practices are capable of measuring the current conditions accurately. The utilization of proven instruments ensures the reliability of the generated data, hence enhancing the measurability of research in accordance with field conditions (Asfahani, 2023; Dybowski et al., 2017).

Table 10 demonstrates the mediation impact of technological self-efficacy on digital technology behaviours. The relationship between infrastructure and digital technology practices (H6) is influenced by technological self-efficacy, acting as a mediator. The estimated coefficient for this mediating role is 0.250, with a *p*-value of .000. A factor with an estimated value of 0.089 and a *p*-value of .019 mediates the relationship between social support for digital technology practices and technology self-efficacy. Understanding educational outcomes requires considering the relevance of self-efficacy beliefs. Self-efficacy pertains to an individual's specific behaviour and motivation, which can either facilitate or impede their performance on their assigned tasks (Dybowski et al., 2017; Hobbs & Tuzel, 2017). According to (Cents-Boonstra et al., 2019), understanding one's traits can help one improve their technology proficiency before engaging in a technology-based activity. Understanding individual traits facilitates the effective utilization of technology by employing appropriate methodologies and maximizing its potential. These findings suggest that vocational teachers should enhance their confidence and competence in utilizing digital technology.

This study provides evidence that infrastructure (H1), with a coefficient of 0.531 and a *p*-value of .000, and the social support component (H2), with a coefficient of 0.190 and a *p*-value of .011, significantly impact technology self-efficacy. These conditions demonstrate that both infrastructure and social support have an impact on vocational teachers' self-confidence in using technology. According to research by (Dybowski et al., 2017; Sharma & Nasa, 2014), infrastructure and social support are just a couple of the factors that can affect self-efficacy. Optimal infrastructural conditions that are in line with technological advancements would foster more confidence among vocational teachers in utilizing technology (Larsson & Löwstedt, 2023). Teachers will be incentivized to cultivate their potential in relation to their responsibilities. Additionally, the support that individuals give vocational teachers fuels their conviction to use digital technology in the learning process (Ginja et al., 2018). According to a study by (Kholifah et al., 2023), internal factors like mental health, drive for improvement, and starting beliefs can also have an impact on vocational teachers' technology self-efficacy.

The infrastructure factor (H3) was found to have a significant influence on vocational teachers' digital technology practices, with an estimated effect size of 0.490 and a *p*-value of .000. Similarly, the social support factor (H4) was also found to play a role, with an estimated effect size of 0.109 and a *p*-value of .012. Additionally, the technology self-efficacy factor (H5) was shown to have a significant impact, with an estimated effect size of 0.472 and a *p*-value of .000. The practical implementation of digital technology practices relies on the help of various other variables. The findings are consistent with previous studies conducted by (Kholifah et al., 2023; Singh, 2022), indicating that both internal and external factors might have an impact on the adoption and utilization of digital technology. Nevertheless, infrastructure plays a critical role in determining the seamless implementation of digital technology (Barrett et al., 2019). As to the findings of (Ming Li & Yu, 2022), it is imperative to use a mixed teaching approach in educational institutions following the COVID-19 pandemic. Naturally, the implementation of this approach necessitates sufficient infrastructure. This measure was established to uphold and sustain the effective educational model practices that have been put into place. Teachers should employ existing infrastructure and possess sufficient digital literacy to address the evolving requirements of contemporary and forthcoming innovative educational models (Ming Li & Yu, 2022; Uzun et al., 2023).

This study collected data on respondents' characteristics, including their learning experience, type of school, field of competence, and gender. The analysis yielded statistically significant results (p-value < .05). These findings imply that respondents can use it depending on their characteristics. In recent times, the majority of educators have undergone an abrupt transition from utilizing traditional face-to-face teaching methods to adopting online teaching models (Bujang et al., 2020; König et al., 2020; Mumcu et al., 2022). The utilization of digital technology in education is extensive in this particular scenario (Curtis et al., 2021; Williamson et al., 2020). Vocational educators must adjust to utilizing and advancing diverse combinations of technologies. According to recent research conducted by (Bujang et al., 2020; König et al., 2020; Mumcu et al., 2022), information and communication technology (ICT) is crucial for teachers to adapt to teaching in the digital age. Specifically, the digital competence of teachers and their access to educational opportunities for improving digital skills are key factors. These findings offer valuable insights for vocational school instructors, educational institutions, and government entities in facilitating the execution of vocational education.

The study's broader educational implications emphasize the need for institutions to prioritize ongoing research initiatives. Exploration of personal factors, motivation, institutional preparedness, service satisfaction, and other potential variables will contribute to a deeper understanding of the nuanced factors influencing vocational teachers' utilization of digital technologies. This collaborative approach between institutions and researchers is pivotal for staying abreast of evolving educational technology landscapes.

5. Conclusion

The study's findings underscore the pivotal role of infrastructure and social support in shaping digital technology practices among vocational teachers within the context of Industrial Revolution 4.0. The research indicates a significant impact facilitated by technology self-efficacy, emphasizing the interconnectedness of these factors. With a statistical significance, the study's comprehensive analysis of direct, indirect, and total effects illuminates the complex dynamics influencing the digital technology landscape for vocational educators.

For vocational teachers, tailored recommendations emerge. Initiatives should be designed to bolster technological self-efficacy through targeted training and workshops, cultivating confidence in navigating digital tools. Simultaneously, fostering a supportive work environment, characterized by collaborative opportunities and professional development, is crucial. Additionally, advocacy for improved infrastructure within vocational institutions is paramount, necessitating collaboration with administration and stakeholders to address challenges and ensure access to contemporary technological resources.

Administrative stakeholders, recognizing the transformative potential of these findings, are advised to allocate resources for ongoing professional development initiatives. These programs should specifically focus on enhancing digital literacy and technological skills among vocational teachers. Adequate funding and prioritization of technological resources, including devices and software, are imperative for sustaining and advancing digital integration in vocational education. Furthermore, cultivating a collaborative culture within institutions, encouraging interdisciplinary cooperation and the exchange of best practices, can amplify the impact of digital technology adoption.

In conclusion, the study not only sheds light on the intricate dynamics shaping digital technology practices among vocational teachers but also provides actionable recommendations for both educators and administrators. By heeding these insights, vocational education can adapt and thrive in the era of Industry 4.0, fostering technologically proficient educators equipped to meet the evolving demands of the digital age.

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